Electronics with the Modular System

Transistor as a diode region

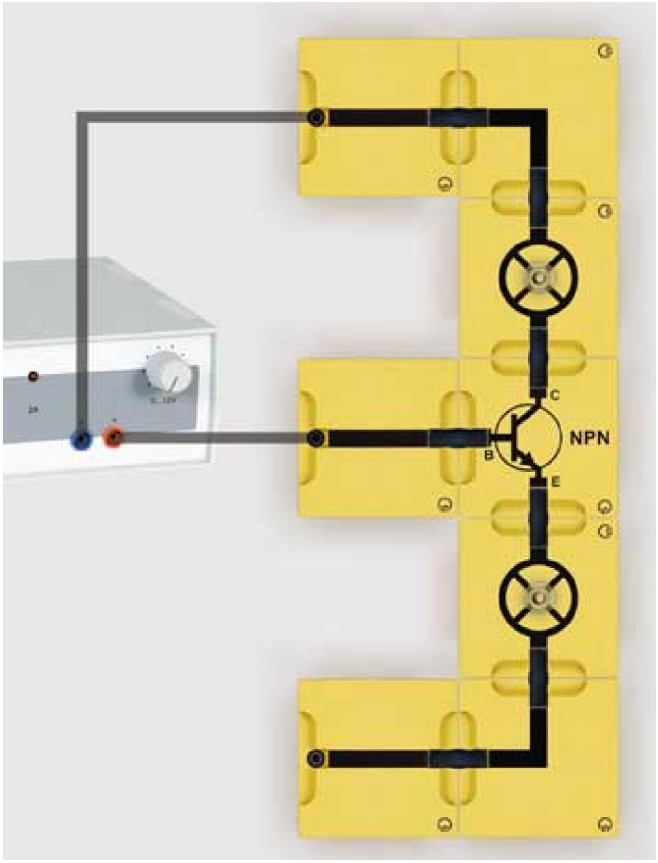
Basic Electronic Circuits

Transistors

Objective of the experiment

To investigate the characteristic of NPN and PNP transistors for different polarities of the base-emitter and base-collector junctions.

Setup



Apparatus

1		539 043	Transistor NPN, BD 137, BST
1		539 044	Transistor NPN, BD 138, BST
2		539 024	Lamp sockets E10, BST
2	from	505 15	Incandescent lamps, 6 V, 0.05 A, E10
3		539 001	Connector blocks BST, straight
2		539 004	Connector blocks BST, 90° angle
7		539 000	Bridging plug, BST
1		521 49	Power supply, 12 V DC, 230 V
2		500 644	Safety connection lead, 100 cm
1		301 300	Demonstration experiment frame
1		301 301	Adhesive magnetic board

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Carrying out the experiment

- Set up the circuit and adjust a voltage of approx. 6 V at the power supply.
- Connect the base of the NPN transistor to the positive terminal of the voltage source and the collector, to the negative terminal.
- Observe lamp 1 and enter the results into the table.
- Reverse the polarity and observe lamp 1 again.
- Connect the base of the NPN transistor to the positive terminal of the voltage source and the emitter, to the negative terminal.
- Observe lamp 2 and enter the results into the table.
- Reverse the polarity and observe lamp 2 again.
- Repeat the experiment with the PNP transistor.

Observation

NPN transistor

Base	Collector	Lamp 1 lit up
+	-	yes
-	+	no

Base	Emitter	Lamp 2 lit up
+	-	yes
-	+	no

PNP transistor

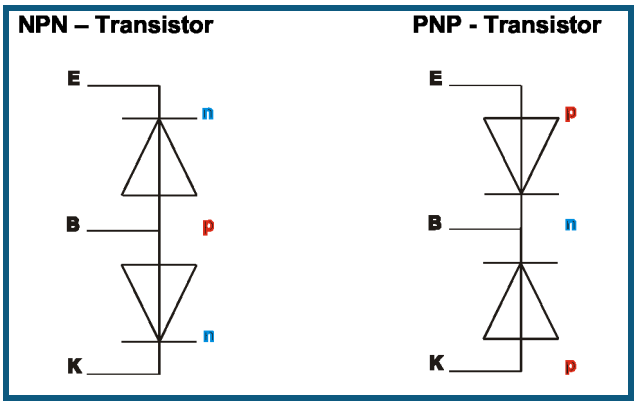
Base	Collector	Lamp 1 lit up
+	-	no
-	+	yes

Base	Emitter	Lamp 2 lit up
+	-	no
-	+	yes

Evaluation

A transistor's base-collector and base-emitter junctions behave like diodes.

Based on the observations, the following equivalent circuit can be deduced for an NPN and PNP transistor:



In an NPN transistor, the base-collector and the base-emitter junctions are connected in the forward direction when the base is positively polarised.

In a PNP transistor, the base-collector and the base-emitter junctions are connected in the forward direction when the base is negatively polarised.